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(54) IMPROVEMENTS IN OR RELATING TO ELECTRICALLY INSULATING PIPE COUPLINGS

(71) We, EISENBAU ALBERT ZIEFLE KG, a German Company, of Oststrasse 17, D-7640 Kehl, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to electrically insulating pipe couplings.

Insulating couplings are used as intermediate parts in metal pipelines for gases and liquids, and may comprise two tubular members inserted one within the other and insulated from one another by plastics material therebetween, the tubular members being compressed together by a compression ring held in place by screw means.

With known pipe couplings of this kind, sealing and rigidity is achieved in that, after screwing up the coupling, the intermediate space still open between the compression ring and the inner tubular member is filled with a hardenable insulating material to fill up the intermediate space.

The necessity of inserting a number of intermediate layers for mutual insulation of the two pipe parts and of filling the intermediate spaces with further insulating material after screwing in the compression ring, makes the construction of these couplings complicated and time-consuming, since the casting process for satisfactory filling of the intermediate spaces can only take place in a certain position and afterwards the finished coupling must be left for a while to harden.

It is an object of the present invention to provide an electrically insulating pipe coupling which is made up from just a few manufactured parts simply by screwing them together in a single working step which is suitable for automatic continuous working, and to create a coupling in which the insulating plastics parts are maintained under constant pressure.

For this purpose, the application of the insulating and sealing means is separated from the actual assembly of the coupling.

[*Price 25p*]

In accordance with the invention there is provided an electrically insulating pipe coupling comprising two tubular coupling members having frusto-conical surfaces of equal and opposite taper, and arranged to be inserted one within the other with their frusto-conical surfaces mutually opposed, and a compression ring arranged to be held in place by screw means engageable with one of the tubular members to force said tubular members together, said frusto-conical surfaces each being coated with an electrically insulating plastics material which has a sealing effect when placed under compression by said compression ring.

Preferably, a sealing ring of electrically insulating material which increases the electrical insulating path length is provided within the outer tubular member between an axial end face of the inner tubular member and an adjacent axial end face of the compression ring.

Coating of the tubular members is preferably effected with a polyamide by a cyclone sintering process, for example with a thermoplastic nylon material of high heat resistance, cold resistance, swelling resistance, adhesion, elasticity, insulating ability, and good chemical resistance. The free sealing ring which may be inserted before screwing up the coupling can be of such a material.

Particularly good protection against faults in insulation through more or less conductive dirt bridges is achieved if both the outer and the inner tubular members are coated with the insulating plastics material over their whole surface — with the exception of the screw-threaded region for receiving the screw means, or regions serving for connection to the associated pipeline by screwing or by welding.

It is also preferable for the part of the compression ring which presses against the axial end face of the inner tubular member or said sealing ring also to be coated with an electrically insulating polyamide deposited by a cyclone sintering process.

The assembly of a preferred embodiment

of coupling as now described is very simple. The tubular members which are coated with a layer of insulating plastics material of for example 0.5 to 1 mm thickness, as well as the compression ring, are pressed together whilst placing a sealing ring of for example 3 mm thickness therebetween. Before this, an adhesive is applied both between the screw threads which are to be screwed together and between the tapering surfaces of the plastics material on the two tubular members which are to be pressed together.

After tightening up the coupling with a force which is fixed for a particular type of coupling, the coupling can no longer be opened and can immediately be used or packed up and transported. Since it is thus no longer necessary to let the tubular members stand after assembly, as was necessary previously after casting in order to avoid the formation of bubbles and to cool the cast material on the site, that is since the inclusion and arranging of the insulating and sealing means in the coupling is in practice completely separated from the actual assembly, i.e. from the final assembly, this assembly can take place to a great extent automatically and by unskilled persons in large numbers, e.g. for the production of serving pipes for houses. Since, moreover, not just narrow sealing rings which lie transverse to the main axis are pressed against one another by screwing the coupling together, but since there is also sealing over longer surfaces encompassing the greater part of the length of the coupling, then not only electrical insulation but also sealing is absolutely reliable. By means of the extensive layers of plastics material, any bridging of the parts to be insulated by the accumulation of dirt is also excluded. Couplings with a nominal diameter of 1 to $2\frac{1}{2}$ inches have for example an electrical breakdown resistance of over 12,000 volts, an internal pressure resistance of up to 100 atmospheres, and a bending and torsional strength which is greater than that of the associated pipes themselves. Thermal resistance is effective at temperatures of up to 100°C. and for a shorter duration even up to 140°C.

Two embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 shows in section in the upper half, and in side view in the lower half, an electrically insulating pipe coupling in accordance with the invention in its assembled state with a screw connection at each end for connection of the coupling to the associated pipes; an alternative coupling termination suitable for welding to the associated pipes is also shown at the extreme right-hand and left-hand sides of the Figure;

Fig. 2 is an exploded view of the coupling of Fig. 1 with its parts arranged as before assembly;

Fig. 3 shows equivalent views of a second embodiment of pipe coupling in accordance with the invention in which a composite compression ring is used, and

Fig. 4 shows the coupling of Fig. 3 with its parts spaced from one another before assembly.

The coupling shown in Figs. 1 and 2 comprises an inner spigot ring 1, an outer socket ring 2, and a screw-in compression ring 3 with a sealing ring 4 between it and the spigot ring 1.

The inner spigot ring 1 has a frusto-conically tapered outer peripheral surface 5 inclined at about $6\frac{1}{2}°$ to the longitudinal axis of the coupling. This outer surface 5 extends at its right-hand end into a screw-threaded region 6 for connection to an associated pipe. With the exception of this screw-threaded region 6, the spigot ring 1 is coated internally and externally with an electrically insulating nylon layer, which may be applied for example by a cyclone sintering method. Instead of this screw-threaded region 6, the spigot ring 1 can alternatively be provided with a weldable end 7 at its right-hand end which projects from the socket ring 2.

The outer socket ring 2 has a frusto-conically tapered inner surface 8 at the same angle of inclination of $6\frac{1}{2}°$ as the spigot ring surface 5. At its left-hand end, the surface 8 extends into a screw-threaded region 9 into which the compression ring 3 can be screwed. With the execution of this screw-threaded region 9, the socket ring is also coated internally and externally with an electrically insulating nylon layer which may be applied in the same way as for the spigot ring 1.

The compression ring 3 has a central threaded section 10 on its outer surface and this is received into the internally threaded region 9 of the socket ring 2. The compression ring 3 has on its inside a connecting screw-thread 11 which can be screwed on to the end of an associated pipe. At its axial end which is remote from the spigot ring 1, the compression ring 3 has a multi-faceted periphery 12 suitable for the use of a spanner. The surfaces of the compression ring 3 to the right of the outer thread 10 and the inner thread 11 as shown in the drawing, i.e. axially inwardly of the area of contact between the ring 3 and the outer socket ring 2 can — but do not have to — be coated with an electrically insulating layer 13 applied in the same way as described above. With the alternative form of the compression ring, which is illustrated at the extreme left-hand side of Fig. 1, a weldable end 14 is provided on the ring instead of the internal thread 11.

The sealing ring 4, which for example can consist of 3 mm thick nylon of the same type as is used for the coating material, is in the assembled position clamped in between the coated axial end surfaces of the spigot ring 1 and the compression ring 3. Both the screw threads 9 and 10 and the plastics-coated inclined surfaces 5 and 8 of the coupling may be rendered undetachable and secure against rotation by applying an adhesive to the surfaces before screwing them together. Moreover, the hardened adhesive represents a second seal which offers security even in the case when the main sealing areas are damaged or become unserviceable.

The embodiment shown in Figs. 3 and 4 is differentiated from that previously described in that the compression ring is of composite construction and includes ring member 18 which has an internal thread for screw connection to an associated pipe but has no external thread of its own. The ring member 18 is pressed into the coupling by a compression part 16 which is provided with an outer screw thread 15 by which it is screwed into the internal thread of the socket ring 2. In this way, when making the screw connection, in contrast to the first embodiment, the frictional effect of the compression ring being screwed against the axially adjacent insulating-sealing parts is avoided, and the ring member 18 can have a radially wider coated pressure surface 17. For this reason, the sealing ring 4 can be omitted in this embodiment if desired. The compression part 16 is screwed in place by means of keys engaging in bores 19 therein which extend parallel to the main longitudinal axis. In this embodiment, the internal thread 11 in the ring member 18 and the external thread 6 of the spigot ring 1 serve to secure the associated pipes at each side of the coupling.

A particularly important feature of the plastics coatings lies in their absolute adhesive strength and impact strength, as well as their insensitivity towards the media passed through the pipes, such as fuels, mineral oil, crude oil, natural gas, coal gas, refinery gas, ethylene, water and the like.

Suitable adhesives for use in the pipe coupling of the present invention are a cyano-acrylate adhesive between the mutually opposed tapered surfaces of the plastics material, and a sealing adhesive marketed under the Registered Trade Mark "Loctite" between screw threads.

WHAT WE CLAIM IS:—

1. An electrically insulating pipe coupling comprising two tubular coupling members having frusto-conical surfaces of equal and opposite taper, and arranged to be inserted one within the other with their frusto-conical surfaces mutually opposed, and a compression ring arranged to be held in place by screw means engageable with one of the tubular members to force said tubular members together, said frusto-conical surfaces each being coated with an electrically insulating plastics material which has a sealing effect when placed under compression by said compression ring.

2. A pipe coupling according to claim 1, in which a sealing ring of electrically insulating material which increases the electrical insulating path length is provided within the outer tubular member between an axial end face of the inner tubular member and an adjacent axial end face of the compression ring.

3. A pipe coupling according to claim 1 or 2, in which the compression ring has a screw thread on its outer surface which is engageable with an internal screw thread in the outer tubular member.

4. A pipe coupling according to claim 1 or 2, in which the compression ring is of composite construction and has a ring member arranged to be pressed against insulating and sealing means at the axial end face of the inner tubular member by a compression part which can be screwed into an internal screw thread in the outer tubular member.

5. A pipe coupling according to any preceding claim, made undetachable by the compression ring being secured in its desired final position by an adhesive coated on the threads of said screw means before assembly of the coupling.

6. A pipe coupling according to any preceding claim, in which the outer tubular member is coated internally and externally over its entire surface apart from a threaded region adapted to receive said screw means with an electrically insulating polyamide deposited by a cyclone sintering process.

7. A pipe coupling according to any preceding claim, in which the inner tubular member is coated internally and externally over its entire surface apart from a region adapted for the securement thereto of an associated pipe with an electrically insulating polyamide deposited by a cyclone sintering process.

8. A pipe coupling according to any preceding claim, in which a part of the compression ring which presses against the axial end face of the inner tubular member or said sealing ring is coated with an electrically insulating plastics material.

9. A pipe coupling according to any preceding claim, in which a nylon or other high polymer material serves as the electrically insulating plastics material.

10. A pipe coupling according to any preceding claim, made undetachable by the engaging surfaces of the plastics material coating said frusto-conical surfaces being

coated with a hardenable adhesive before tightening of said compression ring.

11. An electrically insulating pipe coupling substantially as hereinbefore described with reference to Figs. 1 and 2 or Figs. 3 and 4 of the accompanying drawings.

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Sheet 1

FIG.1

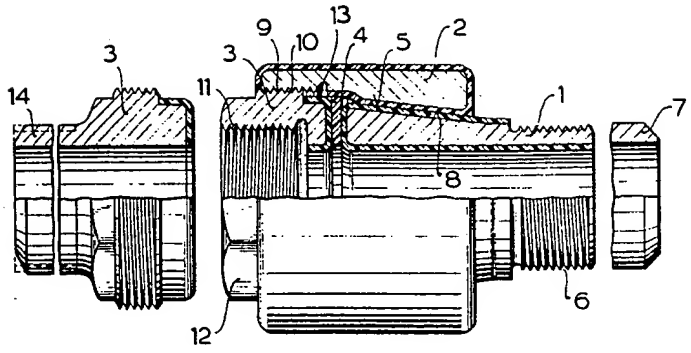
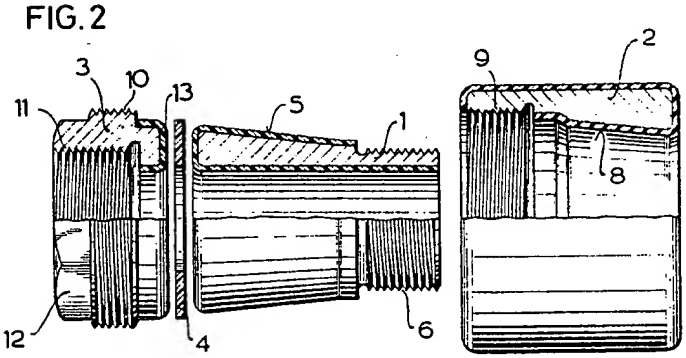


FIG.2



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Sheet 2

FIG.3

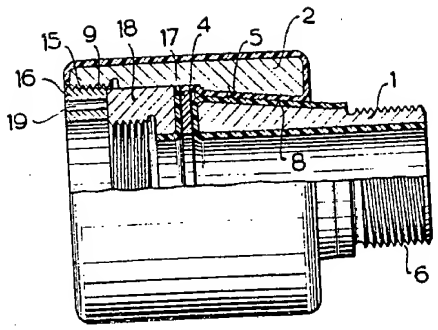

FIG.4